

HIGH CONFIDENCE GROUNDWATER RESERVE DETERMINATION STUDY IN THE BERG CATCHMENT

Background Information Document No.06

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water & sanitation

Department:
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PURPOSE OF THIS DOCUMENT

The purpose of this Background Information Document (BID) is to provide stakeholders with the information and results of the High Confidence Groundwater Reserve Determination Study conducted for the Berg Catchment.

OBJECTIVES OF THE STUDY

The primary objective of was to offer insights into the groundwater resource systems within the Berg catchment, taking into account both the conservation status of priority water resources and the complex geological and hydrogeological features of the study area. The overarching goal was to provide aquifer-specific information with a high level of confidence to facilitate well-informed management decisions concerning stressed or over-utilized groundwater resources.

This study also aimed to align with the gazetted requirements for the Berg catchment and to determine the necessary groundwater contribution to the Reserve. Specifically, the focus was on the groundwater contribution to Basic Human Needs (BHN) and Ecological Water Requirements (EWR), as outlined in the project's Terms of Reference (TORs).

STUDY INPORTANCE

These results of this study are important for mandatory licensing exercises and individual license applications. These license applications, even if seemingly minor in terms of its impact on some catchments, could have significant consequences for ecologically important and sensitive areas.

Stakeholders are encouraged to actively engage in the process by providing feedback on the information shared, participating in meetings or workshops, or reaching out to the stakeholder engagement office or the technical team using the contact details provided below.

CONTACTS

Stakeholder Engagement Office:	David McGibbon Tel: 021 709 6700	Umvoto South Africa (Pty) Ltd. Email: david.m@umvoto.com
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PROJECT WEBSITE LINKS

Study Deliverables

<https://www.dws.gov.za/rdm/currentstudies/default.aspx>

BACKGROUND

In response to the increasing number of Water Use Licence Applications (WULAs) in the Berg catchment and the potential impacts proposed developments may have on water resource quantity and quality, the Department of Water and Sanitation (DWS): Chief Directorate: Water Ecosystems Management (CD: WEM) initiated a “High Confidence Groundwater Reserve Determination Study for the Berg Catchment”. This study aimed to complete the Resource Directed Measures (RDM) process for the Berg catchment and support the gazetted Water Resource Classes (WRCs) and Resource Quality Objectives (RQOs) (Gazette No.42451:121).

The Reserve, i.e., the water “set aside” to provide for BHN and EWR, is the only right to water in NWA, taking precedence over all other water use. Simply put, the Reserve's water requirements **must** be fulfilled before allocating water resources to other users. These requirements, along with other priority demands on water resources, are safeguarded by RQOs. Consequently, in determining the groundwater Reserve for the Berg catchment, significant consideration was given to the volume of groundwater that can be sustainably abstracted without adversely affecting its contribution to surface water flow.

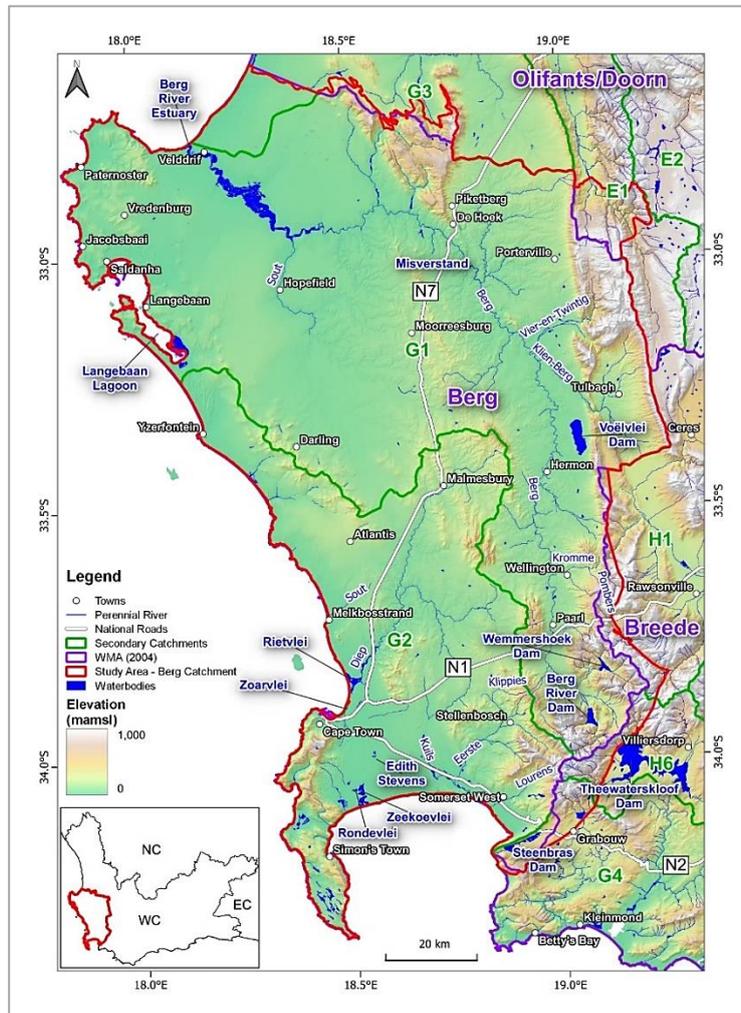


Figure 2 The Berg catchment and the project study area.

GROUNDWATER RESERVE DETERMINATION

To align with the TORs and initiate the GRD process, the previously delineated Groundwater Resource Units (GRUs) in the Berg catchment underwent a thorough re-evaluation and update. This ensured the comprehensive inclusion of all groundwater resources in the catchment. Subsequently, the Ecological Reference Conditions and Present Status (PS) of groundwater systems, assessing both quantity and quality, was re-evaluated for each GRU. Upon completing the PS determination, the groundwater component of the BHN and EWR Reserves was calculated, leading to the establishment of a Groundwater Reserve. Operational scenarios were then developed and evaluated, incorporating stakeholder input to assess various impacts on the Groundwater Reserve. To evaluate potential impacts on GRUs, an Allocation Factor was developed. This factor represents the ratio of the groundwater 'still allocable' (after considering the Reserve requirements and water use) to the total recharge for the GRU. Categorized from 'A' to 'F,' these factors reflect a spectrum from unstressed to potentially critically stressed conditions. A monitoring network was then established, and guidelines for monitoring activities, frequency, and the specific data collection at selected sites, were defined. Unique objectives were set for the groundwater contribution to both the EWR and BHN and was tailored to each GRU's respective Management Option.

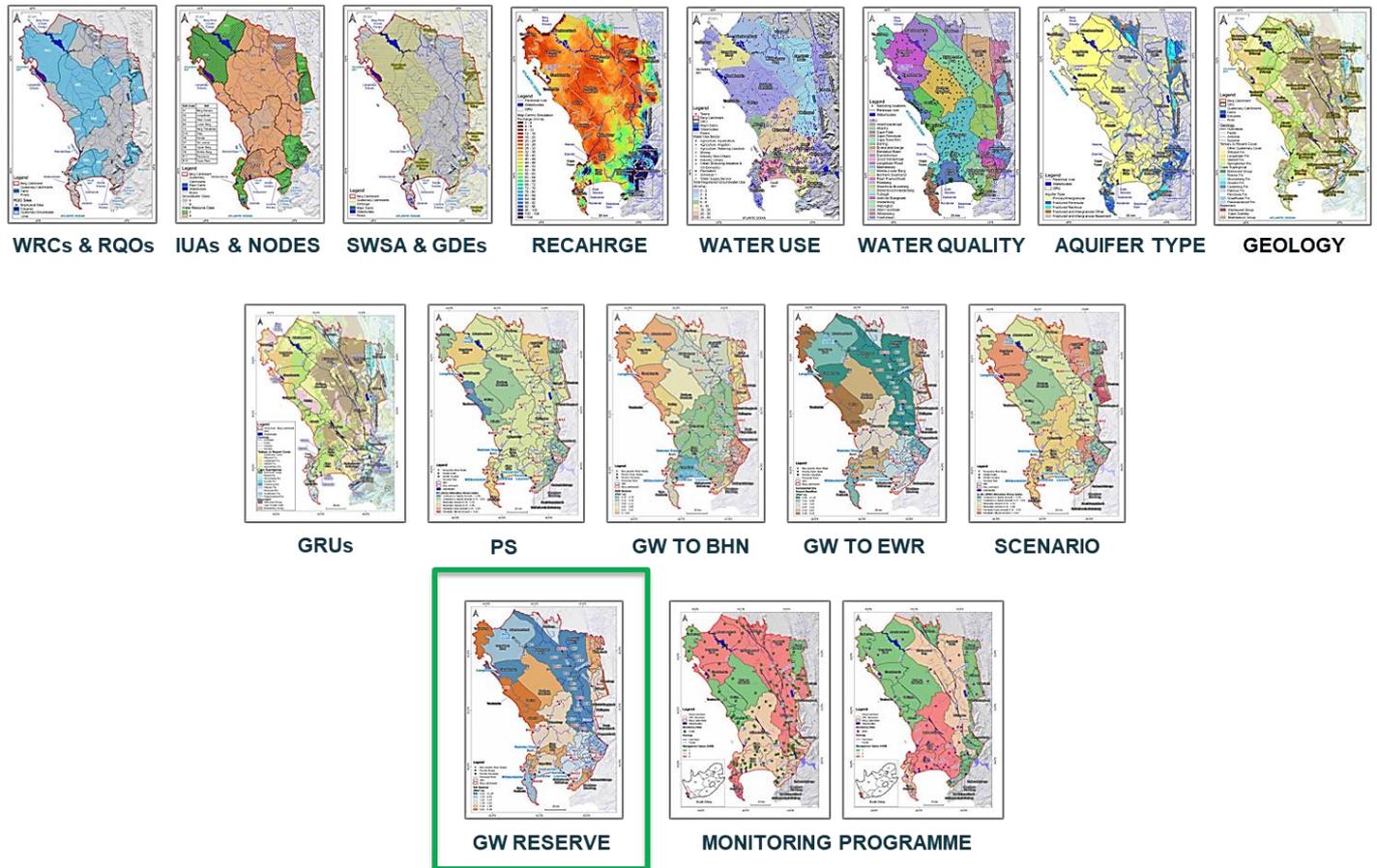


Figure 3: A map summary of the water resource components and corresponding outcomes of the study to date.

Step 8 of the GRD process involved initiating the Gazetting process and the implementation of the Groundwater Reserve. This phase included the compilation of a single Groundwater Reserve Determination Report (i.e., Deliverable 3.7), offering a comprehensive summary of findings and recommendations for the catchment. The overarching goal was to provide aquifer-specific information for various hydrogeological components considered for the Groundwater Reserve, specifically the groundwater contribution to the BHN and EWR.

1) Groundwater Quantity Component

The Berg catchment encompasses a total of 44 Quaternary Catchments, delineated into 25 GRUs. It's important to note Groundwater systems may not always correspond directly to surface water catchments i.e., GRUs can encompass one or more quaternary catchments, or portions thereof (depending on their hydrogeological characteristics).

The Groundwater Quantity Component was calculated considering the total groundwater contribution to both the EWR and the BHN Reserves.

a) Basic Human Needs

The BHN addresses individuals without access to a formal water supply and residing beyond 500m from a perennial river, with a daily water demand set at a fixed value of 25 l/p/d.

b) Ecological Water Requirements

The EWR involved using baseflow separation, wherein groundwater discharge was calculated using monthly flow data calibrated to meet Target Ecological Categories (TECs) for each node, and factoring in cumulative flow effects downstream. A recharge ratio was applied to the total dry season contribution of groundwater to baseflow per GRU and associated aquifer types.

2) Groundwater Quality Component

Data from various sources were collected and analyzed to evaluate baseline water quality and identify potential sources of contamination across the GRUs. The evaluation also included an assessment of selected groundwater parameters for compliance with gazette RQOs (Gazette No.42451:121).

The primary water quality dataset was sourced from the Water Management System (WMS). CoCT data was used in GRUs where WMS monitoring points were lacking. A total of 358 unique monitoring locations were considered across the 25 GRUs, with six GRUs lacking monitoring data, primarily within the fractured Table Mountain Group Aquifers (TMGA).

The Groundwater Quality Component of the Reserve was determined by assessing two primary components:

a) Groundwater Quality Reserve

The Groundwater Quality Reserve was determined based on statistical analysis of the baseline and median concentrations (per chemical parameter) within specific aquifers in the GRUs.

b) Groundwater Quality BHN Reserve / Requirement

Upper limit of Class I Water Quality [Drinking] - South African Water Quality Guidelines, Volume 1: Domestic Water Use, 2nd Ed. 1996. Department of Water Affairs, Pretoria, South Africa.

Project Plan and Progress

	STEP		OUTCOME	STATUS
PHASE 1	Inception		<ul style="list-style-type: none"> • Scope of work • Capacity building programme • Expenditure schedule & projections • Stakeholder engagement planning 	Complete
PHASE 2	Data collection and collation		<ul style="list-style-type: none"> • Collate, review and analyse all available, relevant data and literature pertaining to the project area in the form of a desktop assessment. 	Complete
PHASE 3	Step 1	Initiate Groundwater Reserve Study	<ul style="list-style-type: none"> • Complete a review of available information and data to determine the process and detail of the assessment and determination. • Identify relevant stakeholders to be included in the project. 	Complete
	Step 2	Water RU Delineation	<ul style="list-style-type: none"> • Determine eco-regions, delineate aquifer specific groundwater related RUs (GRUs), select study sites. 	Complete
	Step 3	Ecological Status and Reference Conditions per RU	<ul style="list-style-type: none"> • Determine the reference conditions, Present Ecological Status (PES), Ecological Importance (EI) and Ecological Sensitivity (ES) of each of the selected study sites. 	Complete
	Step 4	Determine BHN and EWR	<ul style="list-style-type: none"> • Determine the groundwater component of the BHN and EWR for all GRUs delineated in the study area, supported by the ecological findings of the gazetted Water Resource Classes and RQOs. 	Complete
	Step 5	Operational Scenarios & Socio-economic	<ul style="list-style-type: none"> • Review current and future operational scenarios and its socio-economic and ecological consequences. 	Complete
	Step 6	Evaluate scenarios with Stakeholders	<ul style="list-style-type: none"> • Evaluate the scenarios with stakeholders where the outcome of Step 3 – Step 5 will be presented, evaluated, adjusted and agreed upon. 	Complete
	Step 7	Monitoring Programme	<ul style="list-style-type: none"> • Design an appropriate monitoring programme by taking into account the hydraulic characteristics and the status of identified water resources. 	Complete
	Step 8	Gazette & implement Reserve	<ul style="list-style-type: none"> • Gazetting template will be drafted, based on the results of the study 	FINALISATION PROCESS